

12-006

**FY14 Application for Nursery Research Funding**  
**Washington State Department of Agriculture - Nursery License Surcharge**  
(Please use one application packet including the Progress Report page for each proposal.  
You must use our form - failure to do so may result in not funding your project.)

Project Title: Native Plant Propagation\_\_\_\_\_

Project Leader: Sierra Smith, Sarah Hamman\_\_\_\_\_

Institution (if any): Center for Natural Lands Management\_\_\_\_\_

Mailing Address: 120 Union Ave SE, Suite 215, Olympia, WA, 98501\_\_\_\_\_

Email: ssmith@cnlm.org\_\_\_\_\_

Project Phone Number: (360) 480-6105\_\_\_\_\_ Cellular/Pager Number: (360) 480-6105\_\_\_\_\_

Note: Project leader or his/her designee must be available at above project phone number on **March 1, 2013** between the hours of 10:00-12:00 and 1:00-3:00.

Amount Requested for (FY13) July 1, 2013 to June 30, 2014: \$25,058

Start Date: July, 1 2012\_\_\_\_\_ Completion Date: June 30, 2015\_\_\_\_\_

(Check One) New Project \_\_\_\_\_ Continuing **X**

If this is a multiple year project, please estimate and list the following information for each future July 1 - June 30 period listed below through project completion:

Fiscal Years (FY)	July 1, 2013 to June 30, 2014	July 1, 2014 to June 30, 2015	July 1, 2015 to June 30, 2016	July 1, 2017 to June 30, 2018	July 1, 2018 to June 30, 2019
\$ Amount Needed	\$25,058	5,000			

If you are increasing the above amounts since your last application, please explain why:

\*Please list all other sources and amounts of funding for this project for the current year only: (Please notify us by March 1st if other funding has been approved and from where.)

Source	\$ Amount Applied For	Approved	Pending Date of Notification
Department of Defense: ACUB Regional Native Plant Production	\$10,000	Yes	End Date: 11/30/13

Total Amount Needed to Fund Project (Include all sources) \$35,058\_\_\_\_\_

If total amount from all sources is not granted, will you be able to complete the project? \_\_NO\_\_\_\_\_  
Explain:

Our current Department of Defense, Army Compatible Use Buffer program funds a portion of the mycorrhizal work and some aspects of plug production, but does not include funding for the detailed stratification study or monitoring of the experiment.

Application for Research Funding (Continued)

Please summarize the purpose of this research: (you may attach additional sheets if necessary or submit this summary in your own format)

Native plant propagation has emerged as a vital aspect in the conservation of endangered ecosystems in the United States and globally. As directed by Congress, the Bureau of Land Management created the Native Plant Materials Development Program in 2001 to help ensure a stable and economical supply of native plant materials for restoration of disturbed lands. This mandate cites private sector growers as one of the key components in the production process. This effectively provides economic stimulus to the nursery industry if basic agronomic factors have been established for the native species of interest. Despite this subsidy, very little information exists for the propagation and growth of many of our most important restoration species. Propagation methodologies need to be scientifically sound, but also cost effective and easy to replicate for both small and large producers working to propagate native species for restoration of disturbed landscapes. The south Puget Sound is a region rich in natural resources, yet it hosts one the most threatened ecosystems in the United States. Over 92% of the short grass prairies and oak woodlands of western Washington have been converted to other land uses and only 3% is now considered to be historic prairie. These ecosystems support a wide array of endemic flora with their associated native pollinators, which are now at risk from encroachment by native trees and shrubs and a host of non-native invasive species. Research has shown that effective restoration must involve seeding or planting of native species once non-natives have been removed. As the capacity for land management agencies to work at larger scales has improved, the availability of native plant materials has become the primary limiting factor in the restoration process. Plant production of restoration species has grown exponentially over the last few years to meet regional restoration needs, producing nearly 350,000 plants in 2012. However, clear production techniques have still not been developed for several regionally important native species. This makes it difficult, if not impossible, for private growers to efficiently produce these native plants.

The purpose of this proposal is to support ongoing research of native plant propagation techniques at the Center for Natural Lands Management's Shottwell's Landing Nursery. Germination and growth requirements of ten South Puget Sound prairie and oak woodland species will be determined by evaluating seed stratification protocols and potential benefit of mycorrhizal inoculation. These protocols will be published on the Native Plant Network database for producers to reference for production information and, if appropriate, in the peer-reviewed scientific literature for both the scientific and management communities. This project supports both restoration science and provides private growers with key information on species propagation needs.

Methods of research:

We will test three important aspects of native plant propagation: 1) Imbibition (pre-sow seed soaking) 2) seed stratification and 3) mycorrhizal inoculation to determine the most effective method of producing quality plugs of native prairie plants for restoration. Ten species have been chosen for this experiment based upon their importance in prairie restoration, a lack of regional propagation protocols and an availability of seed (Table 1). An effort was made to cover a wide range of plant families.

Table 1. Species selected for stratification trials

Species	Common Name	Family
<i>Aquilegia formosa</i>	Western Columbine	Ranunculaceae
<i>Carex inops</i>	Long-stolon Sedge	Cyperaceae
<i>Castilleja levisecta</i>	Golden Paintbrush	Scrophulariaceae
<i>Dodecatheon hendersonii</i>	Mosquito Bills	Primulaceae
<i>Dodecatheon pulchellum</i>	Darkthroat Shootingstar	Primulaceae
<i>Gallardia aristata</i>	Blanket Flower	Asteraceae
<i>Lithophragma parviflorum</i>	Small flowered Woodland Star	Saxifragaceae
<i>Ranunculus occidentalis</i>	Western Buttercup	Ranunculaceae
<i>Silene douglasii</i>	Douglas' Campion	Caryophyllaceae
<i>Solidago missouriensis</i>	Missouri Goldenrod	Asteraceae

The information requested on this page will have a direct bearing on whether your research request is approved or denied. Letters of support by the industry are also encouraged.

**Note:** Funding is not available for general overhead cost.

**Progress Report on Funded Nursery Projects  
Washington State Department of Agriculture**

**Date:** 12/18/2012

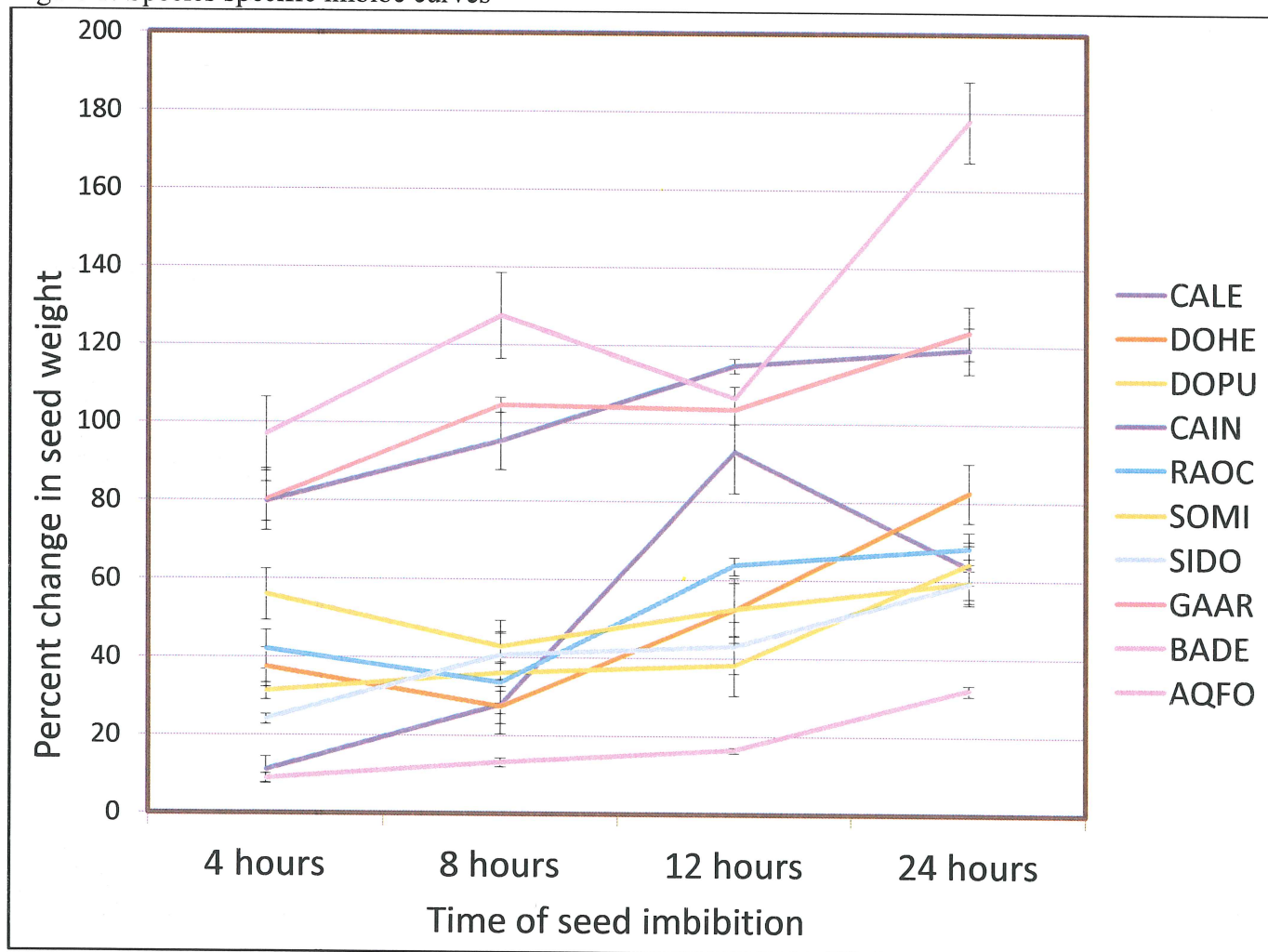
**Project Title:** Native Plant Propagation

**Project Leader:** Sierra Smith, The Center for Natural Lands Management  
Sarah Hamman, The Center for Natural Lands Management

**Progress:**

Phase 1 of the project testing the appropriate length of imbibition (seed soaking) for 10 priority prairie restoration species is complete. The imbibition study was conducted in August of 2012 with 600 seed weight measurements taken. Curves have been generated (Figure 1) and the appropriate length of pre-sow soaking has been determined for each species. This protocol will be used for the stratification phase of the experiment.

Figure 1: Species specific imbibe curves



Phase two of the experiment testing both a smoke water scarification and a variety of lengths of cold stratification has been initiated. The 150 day stratification replicates will be in the germination chamber by January 1, 2013. All stratification treatments will be removed from the germination chamber and sown on June 1, 2013 and monitored for germination for 12 months. The species specific protocols developed during this

phase will be used for the mycorrhizal experiment. Any healthy plant material generated from this phase of the experiment will be used for on the ground restoration on the prairie.

The mycorrhizal experiment will begin stratification in the winter of 2013 and will be sown in the spring of 2014. Monitoring will continue through the fall until outplanting in October 2014. Analysis of the mycorrhizal data will be performed over the winter of 2014 and finalized production protocols will be published in the spring of 2015.

This experiment will be conducted in three phases, each phase informing the design of the next:

**Phase 1 - Seed Imbibition (complete):** Five replicates of 100 seeds for each species will be soaked in room temperature deionized water for 4, 8, 12 and 24 hours. After the prescribed soaking time, seeds will be patted dry and weighed. The trial will establish the imbibition curve for each species. The time at which seed weight stops increasing will become the imbibition time used for the stratification experiment.

**Phase 2 – Stratification (in progress):** The second phase of the project will examine the length of stratification time at 3°C that produces the highest percentage of germinating seeds. This will be coupled with a smoke water treatment, which will determine if any of our target species have a dormancy that is broken by chemical compounds produced during grass fires.

The ideal length of cold stratification will be determined for each species by measuring the percent germination after cold stratification treatments of 0, 15, 30, 60, 90 and 120 days. Five replicates of 50 seeds for each species will be pulled from cold storage (40 °C and 40% humidity), treated with the pre-determined imbibition period, placed in petri dishes with moistened filter paper and put a germination chamber set at 3°C for the prescribed number of days. Dishes will be monitored for germination throughout the stratification period. At the end of the stratification period, all seeds will be sown following our standard propagation protocols and monitored for six months for germination.

The above stratification time treatments will be repeated for each species using 100:1 dilution plant-derived smoke water instead of deionized water for the imbibition period. After the duration is complete, the seeds will be rinsed 3 times in cold deionized water before being put into stratification. This full factorial design will require 30,000 seeds: 10 species x 2 imbibition treatments x 6 cold stratification treatments x 5 replicates x 50 seeds per replicate.

**Phase 3 – Mycorrhizal inoculation:** The third phase of the experiment will utilize the pre-treatments established in Phases 1 and 2, and test the response of our target species to inoculation with either native mycorrhizal fungi or commercial mycorrhizal fungi, relative to no mycorrhizae (control).

After imbibing and stratifying seeds according to the most successful methods from Phases 1 and 2, one hundred seeds of each of our 10 species will be sown into plugs containing one of three treatments: native mycorrhizal inoculum (cultivated from the roots of 8 native prairie species in intact South Sound prairie sites); commercially available mycorrhizal inoculum; or no inoculum at all. All treatments will receive standard water and low fertilizer applications. The effects on survivability and growth (height, crown diameter, above and below-ground biomass) will be monitored monthly for six months from germination.

**Expenditure Breakdown:**

**(Please include salaries, supplies, travel, etc.):**

Fiscal year 2013 funds are being used to complete Phase 1 (imbibition) and initiate Phase 2 (stratification)

Fiscal year 2014 funds will be used to monitor and analyze the stratification study as well as initiate Phase 3 (mycorrhizal inoculation).

The modest request for fiscal year 2015 will be used to finish the monitoring of the mycorrhizal experiment and publish the finished protocols.

**FY 2014:**

Salaries: Plant Propagator 6 weeks \$7,760

Program Manager 4 weeks \$5,560

Restoration Ecologist 4 weeks \$7138

Salary Total: \$20,458

Travel: \$ 600

Outreach: \$500

Supplies: \$3,500

Total: \$25,058